

Case Studies of Small Wind Power

- On-Grid Applications

- Home, Tehachapi, CA
- Home, Charlotte, VT
- Home, Morrison, IL
- Home, Boulder, CO
- Farm, SW Kansas
- Farm, Webster, NY
- Farm, Clover Valley, MN
- Business, Prescott Valley, AZ
- Business, Norman, OK
- Office, Eastern Neck, MD
- Factory, Orland, ME

- Off-Grid Applications

- Home, Ward, CO
- Home, South Park, CO
- Home, Douglas County, CO
- Office/shop, Woodstock, MN
- Business, Block Island, RI
- Commercial/Industrial

- Water-Pumping

- Ranch, Wheeler, TX
- University of Wyoming



Case Study: On-Grid Home

- Tehachapi, California
- Net metering for utility bill reduction
- Bergey Excel wind turbine, 23-ft rotor, 10 kW
- Total installed cost was \$34,122 in October 1999
- California buy down program, \$16,871 cash rebate
- Estimated payback: 8 years



Case Study: On-Grid Home

- Charlotte, Vermont, net metering for utility bill reduction
- Bergey Excel wind turbine, 23-ft rotor, 10 kW
- GridTek inverter 240 VAC, 1 phase
- 1.4-kW PV array
- Installed in 1999



Case Study: On-Grid Home

- Morrison, Illinois
- Utility bill reduction
- Jacobs 26-17.5 wind turbine, 17.5 kW, 26-ft rotor, 120-ft tower
- Electricity production ~15,600 kWh/year
- Installed cost \$15,986 (wind turbine only)
- Installed in 1994



Case Study: On-Grid Home

- Boulder County, Colorado, 5500 ft
- Net-metering for utility bill reduction
- Whisper 3000 wind turbine, 3 kW, 14.8-ft rotor, 23-ft tower
- 8.6-kW PV array
- 54 VDC battery bank
- Trace SW5548 inverters
240 VAC, 11 kW total
- All-electric home with
heat pump & electric
car(s)
- Total cost ~\$100,000



Case Study: On-Grid Farm

- Southwestern Kansas
- Utility bill reduction
- Bergey Windpower Excel turbine, 10 kW, 23-ft rotor, 100-ft tower
- Electricity production ~21,000 kWh/year
- Utility bill savings ~\$2,800/year
- Installed in early 1983, ~\$20,000
- Received federal tax credit
- Maintenance costs, \$50/year
- One lightning strike, one blade was replaced



Case Study: On-Grid Farm

- Clover Valley, Minnesota
- Utility bill reduction
- Whisper 3000 wind turbine, 3.0 kW, 14.8-ft rotor, 50-ft tower



Case Study: On-Grid Farm

- Webster, New York
- Utility bill reduction
- Bergey Excel wind turbine, 10 kW



Case Study: On-Grid Office Building

- Headquarters building for the Eastern Neck Wildlife Refuge, Maryland (U.S. Fish and Wildlife Service)
- Utility bill reduction
- Bergey Windpower Excel wind turbine, 10 kW, 23-ft rotor
- Installed April, 2002
- Anticipated electricity production ~10,000 kWh/year
- Total installed cost, \$40,000



Case Study: On-Grid Small Business

- R&M Mechanical Systems,
Norman, Oklahoma
- Net-metering for utility bill reduction
- Bergey Windpower Excel wind turbine,
10 kW, 23-ft rotor, 80-ft tower
- Electricity production, ~15,000 kWh/y
- Utility bill savings, ~\$1,300/year
- Installation cost in 1984, ~ \$22,000
- \$8,000 tax credit and 5-y depreciation
- Maintenance and repair costs, ~\$75/y



Case Study:

Call Center Uninterruptible Power

- BioTreasures Distribution/Call Center, Prescott Valley, AZ
- Uninterrupted loads: lighting, phones, computers, security/fire alarms
- Utility-served loads: air-conditioning, non-critical lighting
- Total installed cost \$54,000 in 2002. Estimated payback - 5 Years.
- Whisper H40 wind turbines, 35 ft towers, 1.8 kW total
- PV panels, 1.9 kW
- 48 VDC battery, 1050 Ah
- Two inverters, 11 kW total



Economics:

BioTreasures Call Center

Total system cost: \$54,000

Projected 5-year savings

- AZ tax credit (2 years): \$2,000
- Fed credit (10%/system): \$5,400
- APS PV buyback (\$2/KW): \$3,840
- No down-time savings: \$9,000
- Utility savings @ \$400/mo: \$24,000
- Depreciation tax savings: \$11,000
(\$10,800/y for 5 years)

Total 5-year savings: \$55,240

[Savings beyond 5th year: \$6,600/year]



Case Study: On-Grid Factory

- G.M. Allen & Sons
Blueberry processing plant,
Orland, Maine
- Net-metering for utility bill
reduction
- Atlantic Orient 15/50 wind
turbine, 50 kW, 49-ft rotor,
100-ft tower
- Installed cost, ~ \$150,000
in 2001



Case Study: Off-Grid Home

- Ward, Colorado, 9,000 ft
- Bergey 1500 wind turbine
1.5 kW, 70-ft tower
- Solarex PV panels, 480 W
- 24 VDC battery, 375 Ah
- Onan generator, propane-fueled, 3 kW
- Trace inverter, 120 VAC, 1 phase
- Today's replacement cost ~\$20,000
- Propane used for range, refrigeration,
space heat, hot water (w/solar preheat)
- First wind turbine installed in 1978, fourth
wind turbine now in service



Case Study: Off-Grid Weekend Cabin

- South Park, Colorado, at 9660 ft
- Southwest Windpower 503 wind turbine, 500 W, 5-ft rotor, 32-ft tower
- Off-grid cabin occupied 2–3 weekends/month
- Space heat from wood & propane
- Propane used for hot water, range, and refrigerator
- PV panels, 188 W
- 24 VDC battery bank
- Heart inverter, 2.5 kW, 120 V AC
- Installed cost in 1986–1992, ~\$7500
- Today's cost, ~ \$5,000



Case Study: Off-Grid Home

- Douglas County, Colorado, 7,000 ft
- Whisper 4500 wind turbine, 4.5 kW, 14.8-ft rotor, 63-ft tower
- Whisper H900 wind turbine, 900 W, 7-ft rotor, 30-ft tower
- Solec PV panels, 1.44 kW
- 48 VDC battery bank
- Pair of Trace SW4048 inverters, 240 VAC, 1 phase, 8 kW total
- Diesel generator, 12 kW
- All electric home
- Installed cost ~\$30,000, owner designed and installed



Case Study:

Off-Grid Office and Shop Building

- Wind farm maintenance shop and office, Woodstock, Minnesota
- Electric loads include lighting, PC, and shop tools
- Passive solar day-lighting, corn used for space heat
- Installed cost \$6,800 in 2001 (grid extension alternative: \$7,500)
- 1200 ft² shop, 900 ft² office
- Whisper H40 wind turbine, 900 W, 35-ft tower
- PV panels, 500 W
- 24 VDC battery, 750 Ah
- 4-kW inverter, 120 VAC single phase



Case Study: Off-Grid Small Business

- Goose and Garden Green House, Block Island, Rhode Island
- Battery charging
- Bergey Windpower Excel wind turbine, 7.5 kW, 23-ft rotor, 60-ft tower
- Installed in 2000
- Electricity used in greenhouse and to recharge electric pickup truck batteries



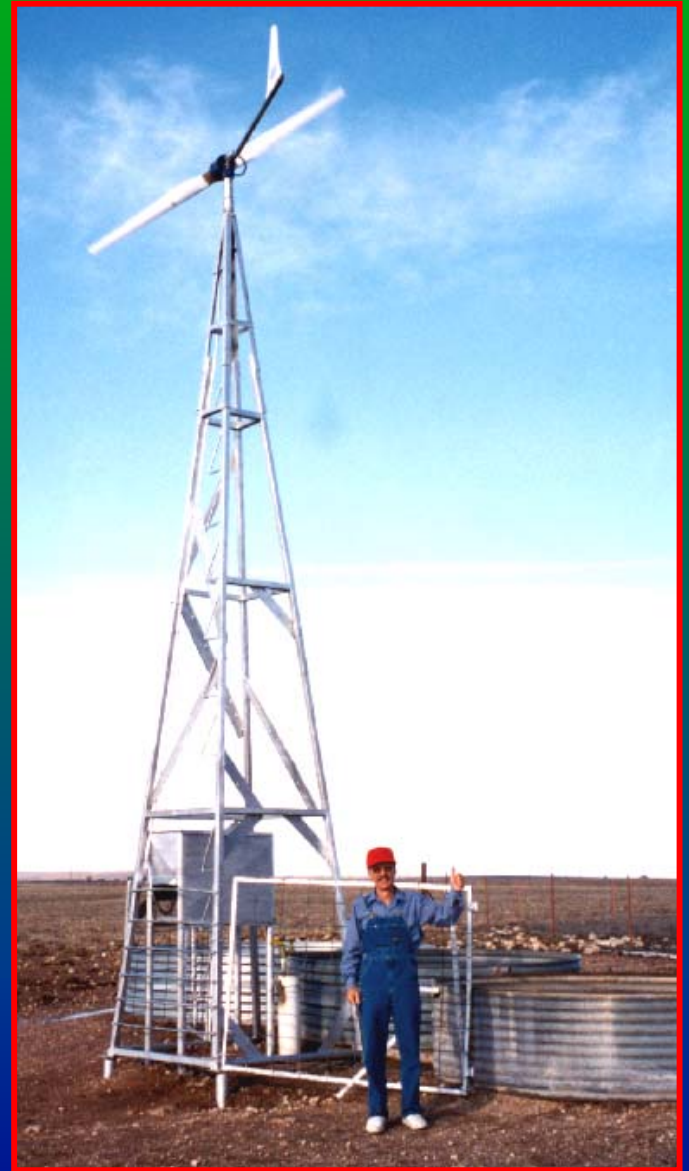
Off-Grid Commercial/Industrial Systems

- Remote repeater sites for radio, telephone, and other communications
- Remote sites for radar and navigation beacons
- Cathodic protection of pipelines, offshore platforms, etc.
- Remote systems for data acquisition and control, environmental monitoring, etc.
- Buoys, lights, navigational aids, etc.



Case Study: Off-Grid Water-Pumping

- Ranch near Wheeler, Texas
- Water-pumping for 120 head of cattle
- Whisper 1000 wind turbine, 1 kW, 9-ft rotor, 30-ft tower



Case Study: Off-Grid Stock Tank Pumping & Heating

- University of Wyoming
- Bergey Windpower
1500 wind turbine,
1500 W, 10-ft rotor



Wind-powered heater maintains
pool of open water

